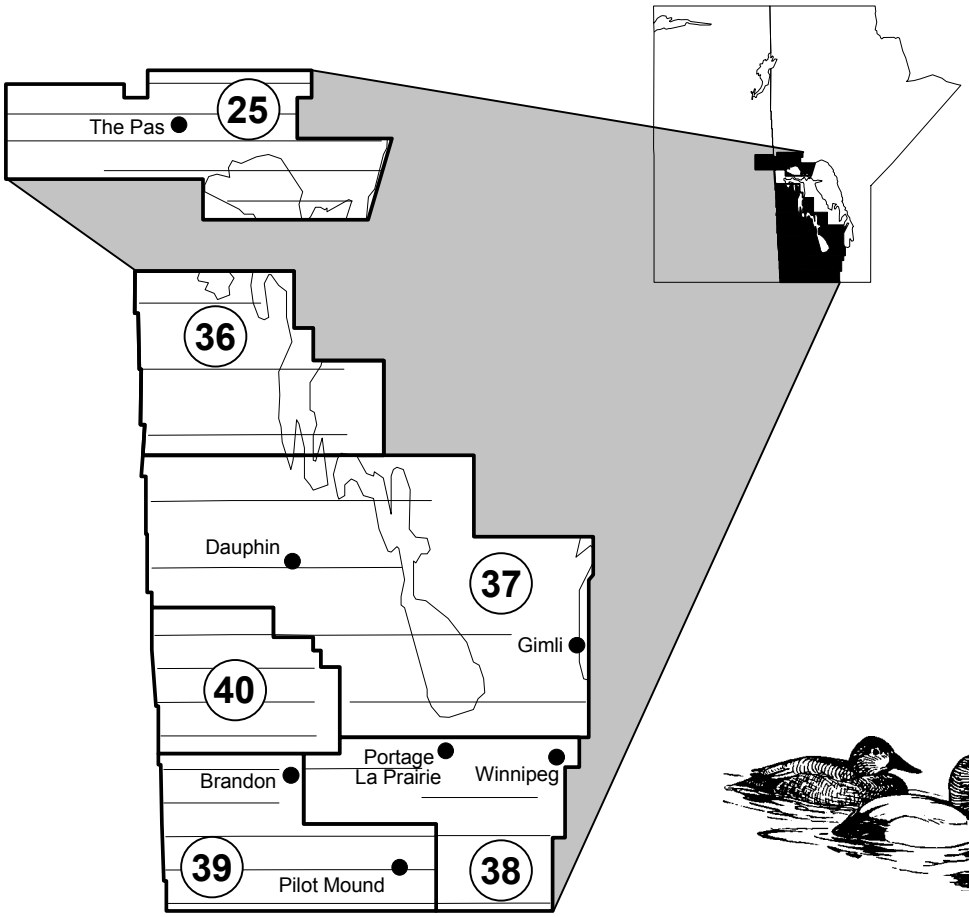
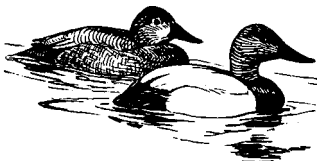
Waterfowl Breeding Population Survey

MAY 2002

Southern Manitoba and Saskatchewan River Delta





UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE

AND

ENVIRONMENT CANADA
CANADIAN WILDLIFE SERVICE

TITLE: Waterfowl Breeding Population Survey for Southern Manitoba and the Saskatchewan River Delta

STRATA SURVEYED: 25, and 37 through 40 (with estimates for Stratum 36)

DATES: May 13 - 26, 2002

DATA SUPPLIED BY: United States Fish & Wildlife Service (USFWS)
Canadian Wildlife Service (CWS)
Manitoba Conservation (MC)
Ducks Unlimited, Canada (DUC)

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ABSTRACT:

The 2002 survey was conducted from May 13 - 26. A resultant aircraft crash and post impact fire at Swan River, Manitoba, terminated the survey on May 27. Both computers with the May 27 data information were destroyed and no data was salvageable for Stratum 36. Partial data sets were available from data transfer made to diskettes and left in the motel room. All air/ground segments had been transferred to the CWS ground crew. Through the efforts and expertise of Mark Otto, FWS, DMBM - MAS, statistically valid methods were established to glean population estimates for the report area. Because data was missing for stratum 36, we predicted population estimates using past data from Stratum 36 (1971-2001), 31 and 37 estimates, and Durban Air/Ground segment "ground" pond counts (1971-2002) in a time-series and regression model. We accounted for estimates of zero birds both in the data used in the model and in the predictions

A dry and relatively cool winter prevailed throughout the survey area until late winter and early spring when average temperatures got even cooler. Although the area received close to average precipitation during this spring the previous years'dry conditions left over from 2001 prevailed.

The resultant cold and drought conditions made wide areas of "poor" breeding duck habitat with a few "fair" and "good" areas in the central part of the crew area.. Conditions during the survey ranged from a high of + 30° C on one day to three mornings when fresh ice was observed on shallow ponds, as well as one morning of 4 inches of snow throughout the west central portions of Manitoba and eastern Saskatchewan. These environmental conditions, plus the destruction of peripheral nesting habitat by ever encroaching farm machinery into dry wetland basins, probably resulted in poor nesting and hatching success.

The varied amounts of precipitation throughout the crew area during winter and spring, resulted in - 58.4% fewer ponds than in 2001, - 50.3% fewer than the 10-year mean, and - 52.4% fewer than the Long Term mean (Table 1). The 1.76 million estimated ducks is the 37 th lowest number in the 48 years of the survey (Appendix 1) and the 327.2 thousand ponds (Table 2) is the lowest since 1989. There have only been three other years when fewer ponds have been estimated.

METHODS:

Methods used in this survey are described in the Standard Operating Procedures for Aerial Waterfowl Breeding Ground Population and Habitat Surveys in North America, Section III, revised in 1987. Waterfowl and habitat data were collected using laptop computers and transcribed into a program developed by Jack Hodges MBM-AK.

This is the third year that the summary data from Stratum 25 has been included in these survey results. The MBM-PAS calculated all data from previous Stratum 25 summaries and has been included in Table 1, Appendix 1, and Figure 1. Pond data is not collected in Stratum 25. Thanks to Flyway Biologist Fred Roetker and crew for collecting the data for Stratum 25.

This was the fourth year that King was Pilot/Observer and the first year for Flyway Biologist Bollinger as Pilot/Observer in the Manitoba Stratum. A Cessna 206 amphibious aircraft (N753)

was used for the survey. An estimated total of 20 flight hours were needed to survey strata 37-40. There were 5 days during the survey that the air crew was unable to fly. All due to inclement weather. Survey data for strata 34-35 was collected and transferred to the Southern Saskatchewan air crew via DMBM - MAS.

WEATHER AND HABITAT:

The Prairie Farm Rehabilitation Administration (PFRA) monitors drought conditions throughout Canada and make estimates of conditions during the year. Estimates of precipitation by PFRA from September 1, 2001 to April 30, 2002 indicated a general mid-range wetness of 40 - 60 percentile throughout most of the survey area. A few Extremely Low areas existed in the very southern portion of the area near the U.S.- Canada border. Percent of average precipitation estimates were in the Below Average (60-85% of average) category to a few areas of Average (85-115% of average) in the central portion, and a few areas of Well Below Average (40-60% of average) in the far southwest area of the Province. Only the west central portion of the crew area was judged to have adequate water. Climatic conditions in the Prairie Provinces, including Manitoba, were - 4 ° C below average for spring temperature. This was the coolest spring on record for the 54 years of data. The nearest "cold" spring average temperature was - 2.9 ° C in 1967 (Environment Canada).

BREEDING POPULATION ESTIMATES:

The 2002 breeding waterfowl population data are listed by strata and species in Table 1. Total duck populations for southern Manitoba were -13.5% lower than 2001, only - 3.5% below the 10-year mean, and - 13.3 % below the Long-Term mean. A comparison of duck populations for each stratum and each species is, also found in Table 1 and Long Term trend in duck population estimates are found in Appendix 1.

Dabbling duck populations were - 17.6 % lower than 2001, - 3.6 % lower than the 10-year mean and - 16.3 % lower than the long term mean. Dabbling ducks make up 69.2% of all ducks in the survey area. Of the 1.76 million ducks in the survey area, mallard comprised 28% and blue-winged teal 19%, respectively of the total. Dabbler species with positive gains over 2001 were wigeon (96.6%), green-winged teal (29.4%), gadwall (27 %), and mallard (4.9%). Those species that were lower than 2001 included pintail (- 66.3%), shoveler (- 44.5%), and blue-winged teal
(- 35.5%). Pintail showed the greatest decline over the long term mean at - 74.7 %.

Diving ducks were 1.5 % higher than 2001, no change from the 10-year mean, but - 4.4% lower than the long-term mean. Redheads indicated the largest decrease of - 36.1% of 2001 totals and goldeneyes, scaups, and bufflehead were - 28.3 %, - 22.3 %, and - 14 1 % lower respectively from 2001 numbers. Ruddy ducks indicated the largest increase of 83.3% over 2001, while

canvasback and ring-necked duck estimates were 16.2 % and 40.3 % respectively above 2002 numbers. Only scaups and redhead were the only species below the long term average at - 67.1

% and - 8.8 % respectively.

Table 2. illustrates the comparison of pond estimates for May. Ponds are not counted in Stratum 25. May ponds were more than - 50 % below 2001, the 10-year mean, and long term mean.

Table 3. summarizes the survey design of each strata with the expansion for each area.

The 2001 trend graphs for all species include population estimates from 1955 through 2002 for all duck species including Canada geese, coot, and ponds.

CONCLUSIONS AND OBSERVATIONS:

The continued Prairie wide drought was evident in 2002. This coupled with an extended cool spring and tumultuous weather had negative effects on breeding ducks throughout the area. The effects of cold temperatures and windy conditions were prevalent during the survey period. The high temperature of a balmy + 30 ° C on May 21, contrasted sharply with - 2 ° C and blizzard conditions just 24 hours later. The next morning many ponds were covered with ice and snow and - 7 ° C. During the survey the crew often saw flocks of + 50 ducks on larger more permanent wetlands. It is believed these birds will add nothing to the "fall flight". All stratum in the survey area showed decreased pond numbers over the long term mean.

In addition to the cold and dry spring farmers took the opportunity to plow further into the ring of residual nesting habitat and construct drainage ditches in once wet basins. This not only reduced the chance of successful nesting, but will have negative impacts for years to come!

ACKNOWLEDGMENTS:

We would like to thank Dave and Jim Wall of Maple Leaf Aviation, Brandon, Manitoba, for the care and "feeding" of our aircraft, their friendship and advice. Thanks to the CWS ground crew for their hospitality and especially Marc Schuster for air/ground coordination efforts.

Submitted by: Rodney J. King, Flyway Biologist, DMBM, Mare Island, CA
Date: June 29,2002

Table 1. Status of waterfowl breeding population estimates (thousands, adjusted for visibility bias) by species and stratum with comparisons against the previous year, the previous 10-year mean, and the long-term mean for Southern Manitoba.

	Stratum										% Change From		
Species/Ponds	25	36	37	38	39	40	2002 Total	2001 Total	10-Year Mean	Long-Term Mean	2001	10-Year Mean	Long-Term Mean
Ducks													
Dabblers													
Mallard	98.5	18.1	134.5	42.2	94.8	111.0	499.2	476.0	466.2	493.1	4.9%	7.1%	1.2%
Am. black duck	0.3	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.6	0.4	--	-44.0%	-26.4%
Gadwall	13.1	1.5	48.8	3.6	18.4	59.5	144.9	114.1	99.1	72.3	27.0%	46.2%	100.5%
Am. wigeon	22.0	1.1	4.7	1.4	3.8	10.7	43.7	22.2	41.6	99.1	96.9%	5.2%	-55.9%
Am. green-winged teal	18.1	1.3	3.5	0.0	9.1	11.6	43.6	33.7	65.3	64.0	29.4%	-33.2%	-31.9%
Blue-winged teal	105.6	5.0	72.6	21.4	61.8	69.4	335.7	520.6	367.7	471.2	-35.5%	-8.7%	-28.8%
N. shoveler	19.4	1.2	19.7	6.7	24.3	48.2	119.5	215.2	151.6	124.2	-44.5%	-21.2%	-3.7%
N. pintail	2.4	0.3	6.8	2.0	7.8	14.7	34.0	100.7	74.1	134.1	-66.3%	-54.2%	-74.7%
Subtotal	279.4	28.5	290.6	77.3	220.0	325.1	1220.9	1482.5	1266.2	1458.4	-17.6%	-3.6%	-16.3%
Divers													
Redhead	21.7	0.7	26.6	0.5	18.1	12.0	79.5	124.5	102.3	87.2	-36.1%	-22.2%	-8.8%
Canvasback	23.2	1.3	30.2	0.0	10.3	21.4	86.4	74.4	92.4	81.9	16.2%	-6.4%	5.6%
Scaups	18.9	4.2	19.2	1.1	14.8	10.4	68.6	88.3	138.4	208.4	-22.3%	-50.4%	-67.1%
Ring-necked duck	63.3	0.9	2.8	0.0	11.5	14.7	93.3	66.5	56.5	45.1	40.3%	65.1%	106.8%
Goldeneyes	19.6	3.3	10.2	0.0	0.0	4.5	37.6	52.5	41.2	33.7	-28.3%	-8.8%	11.7%
Bufflehead	5.3	3.9	8.8	0.0	7.9	14.1	40.0	46.5	49.7	31.7	-14.1%	-19.6%	26.2%
Ruddy Duck	12.8	0.5	21.3	0.0	36.6	50.1	121.3	66.2	46.5	62.7	83.3%	161.0%	93.3%
Subtotal	164.7	14.9	119.1	1.6	99.2	127.3	526.8	519.0	526.9	550.7	1.5%	-0.0%	-4.4%
Miscellaneous													
Long-tailed duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.1	--	-100.0%	-100.0%
Eiders	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	--
Scoters	0.8	0.0	0.0	0.0	0.0	0.4	1.3	0.0	1.9	3.7	--	-34.6%	-65.8%
Mergansers	5.0	7.3	2.2	0.0	0.0	1.5	16.0	38.7	33.2	23.5	-58.7%	-51.9%	-32.0%
Subtotal	5.8	7.3	2.2	0.0	0.0	1.9	17.2	38.7	35.4	27.2	-55.5%	-51.4%	-36.7%
Total Ducks	449.9	50.7	411.9	78.9	319.2	454.2	1764.9	2040.2	1828.4	2036.3	-13.5%	-3.5%	-13.3%
Canada Goose	20.2	3.8	37.4	3.6	5.4	22.6	92.9	53.9	62.5	34.4	72.3%	48.7%	170.2%
Am. coot	193.1	2.2	23.0	0.0	71.7	149.9	439.8	346.1	273.3	212.1	27.1%	60.9%	107.4%
Ponds	-	64.4	77.8	45.8	52.0	87.2	327.2	785.8	658.6	687.1	-58.4%	-50.3%	-52.4%

Table 2. Long-term trend in adjusted May pond estimates (thousands) by stratum with comparisons against the previous year, the previous 10-year mean, and the long-term mean for Southern Manitoba. Note that ponds are not counted in stratum 25.

	Stratum						
Year	25	36	37	38	39	40	Total
1961		33.1	289.8	36.3	117.7	109.6	586.6
1962		25.2	313.5	31.9	74.8	88.2	533.6
1963		47.8	247.7	53.2	162.5	168.8	679.9
1964		77.4	289.6	38.6	253.2	250.3	909.1
1965		141.8	443.8	72.6	246.0	218.4	1122.6
1966		115.8	433.2	62.8	242.0	212.4	1066.3
1967		129.0	503.3	70.1	182.7	234.9	1120.0
1968		39.8	153.9	27.4	46.3	67.9	335.3
1969		59.6	153.1	36.8	126.3	87.3	463.1
1970		79.4	368.2	63.1	262.2	262.2	1035.2
1971		69.9	239.9	60.5	200.7	183.5	754.6
1972		103.8	431.5	48.1	180.4	250.0	1013.7
1973		82.6	137.6	33.6	97.7	82.4	433.9
1974		141.7	559.5	67.2	324.6	356.2	1449.1
1975		59.7	264.2	53.3	296.2	264.1	937.6
1976		75.5	444.0	61.7	376.4	231.0	1188.7
1977		35.6	208.2	39.2	67.0	90.0	439.9
1978		129.9	312.5	31.7	114.9	191.3	780.3
1979		67.6	268.5	42.1	202.5	211.7	792.4
1980		32.4	103.2	31.6	58.5	60.9	286.7
1981		30.4	107.8	23.1	47.5	54.0	262.8
1982		27.0	131.1	25.3	88.2	87.4	359.0
1983		89.2	271.7	34.3	163.3	153.9	712.4
1984		69.3	159.1	36.5	86.3	58.2	409.4
1985		45.4	234.6	29.0	83.7	103.6	496.3
1986		94.3	383.8	70.2	197.1	202.2	947.5
1987		42.1	165.2	37.6	119.4	133.8	498.1
1988		108.2	318.5	43.4	48.8	113.6	632.5
1989		36.6	99.1	38.2	63.5	46.8	284.2
1990		80.7	348.5	35.7	52.4	145.2	662.4
1991		28.8	147.1	32.4	70.8	114.0	393.1
1992		61.9	261.9	54.0	150.3	136.6	664.8
1993		48.3	216.8	55.7	63.4	99.2	483.4
1994		45.8	157.9	37.0	89.4	65.6	395.7
1995		79.7	332.1	65.2	239.5	172.9	889.4
1996		76.9	371.2	54.5	177.2	150.1	829.8
1997		99.9	467.5	84.5	157.4	159.2	968.5
1998		43.0	194.9	44.3	124.1	85.7	492.1
1999		36.8	185.6	32.6	204.6	151.1	610.7
2000		45.6	184.0	27.5	91.3	117.3	465.7
2001		31.1	324.7	122.9	144.0	163.1	785.8
2002		64.4	77.8	45.8	52.0	87.2	327.2
10-year Mean		56.9	269.7	57.8	144.1	130.1	658.6
Long-term Mean		67.5	273.9	47.5	148.6	149.6	687.1
Percent Change:							
From 2001		107.3%	-76.0%	-62.7%	-63.9%	-46.6%	-58.4%
From 10-year Mean		13.2%	-71.1%	-20.7%	-63.9%	-33.0%	-50.3%
From Long-term Mean		-4.7%	-71.6%	-3.4%	-65.0%	-41.8%	-52.4%

Table 3. Survey design for Southern Manitoba and the Saskatchewan River Delta, May, 2002.

	Stratum						
Survey Design*	25	36	37	38	39	40	Total
Sq. Mi. in the stratum	7,644	5,500	16,485	5,655	6,552	4,536	46,372
Sq. Mi. in sample	135	58.5	135.0	54.0	121.5	67.5	571.5
Linear Mi. in sample	540	234	540	216	486	270	2,286
No. of transects in sample	5	3	4	3	5	4	24
No. of segments in sample	30	13	30	12	27	15	127
Expansion factor	56.622	94.017	122.111	104.722	53.926	67.200	

*Fire damage to computers resulted in the partial loss of data in various strata. Current year design varied widely from stratum to stratum and expansion factors for each stratum is on record at FWS, DMBM - MAS.

Appendix 1. Long-term trend in adjusted waterfowl breeding population estimates (thousands).

Species/Ponds	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964
Ducks										
Dabblers										
Mallard	549.9	811.4	852.4	1116.6	702.5	647.2	442.6	292.5	428.6	534.7
Am. black duck	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.5	2.1	0.5
Gadwall	31.4	18.9	23.6	34.1	35.5	28.0	62.2	41.2	84.3	70.7
Am. wigeon	162.3	140.2	120.8	392.7	292.2	106.4	130.4	100.1	118.4	166.3
Am. green-winged teal	36.9	17.8	29.6	74.7	57.1	21.7	67.3	21.0	69.3	10.7
Blue-winged teal	514.8	313.3	399.1	1198.2	1302.2	729.2	543.5	439.2	538.4	490.9
N. shoveler	57.4	66.5	93.4	84.3	198.3	158.0	138.1	75.9	159.9	167.8
N. pintail	335.1	296.2	210.4	208.6	149.0	256.7	115.3	122.5	196.4	141.6
Subtotal	1687.9	1665.1	1729.1	3109.1	2736.7	1947.1	1499.4	1093.0	1597.3	1583.2
Divers										
Redhead	66.3	69.9	55.2	99.1	123.7	88.6	77.7	50.6	105.7	117.9
Canvasback	80.5	79.6	54.4	138.3	109.0	131.3	123.1	58.3	100.6	101.3
Scaups	225.3	235.3	281.6	598.0	416.6	289.1	271.1	184.3	269.5	218.6
Ring-necked duck	27.2	25.3	7.0	18.4	55.7	13.0	17.7	21.2	46.2	24.1
Goldeneyes	17.8	13.3	17.5	34.6	87.7	53.9	25.4	29.0	16.4	10.6
Bufflehead	16.3	7.5	2.9	10.9	14.7	9.6	23.1	7.8	20.6	14.3
Ruddy Duck	28.9	28.6	24.9	24.6	81.3	62.5	95.3	55.0	106.2	74.9
Subtotal	462.3	459.7	443.4	923.9	888.8	648.0	633.4	406.2	665.3	561.7
Miscellaneous										
Oldsquaw	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eiders	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scoters	3.4	7.5	0.9	10.3	10.1	0.0	1.6	0.5	1.4	2.2
Mergansers	14.2	2.6	0.6	1.2	1.6	5.0	1.9	4.7	8.7	19.3
Subtotal	17.6	10.1	1.6	11.4	11.7	5.0	3.5	5.3	10.1	21.6
Total Ducks	2167.8	2134.9	2174.1	4044.4	3637.1	2600.2	2136.3	1504.5	2272.7	2166.4
Canada Goose	5.6	31.5	0.0	8.8	3.5	9.5	7.4	11.0	9.0	8.4
Am. coot	18.8	45.7	27.8	77.0	286.6	121.5	239.7	52.0	112.5	117.2
Ponds							586.6	533.6	679.9	909.1

Species/Ponds	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
Ducks										
Dabblers										
Mallard	372.0	431.5	468.3	435.1	659.7	757.2	458.3	576.6	370.1	421.0
Am. black duck	0.1	0.4	1.1	1.6	0.2	0.2	0.3	0.0	0.0	0.0
Gadwall	54.5	86.6	98.0	71.0	58.5	59.8	51.8	86.5	86.9	58.1
Am. wigeon	177.0	130.4	96.3	144.5	173.5	155.3	112.6	150.9	163.6	108.3
Am. green-winged teal	39.4	60.9	83.2	58.5	174.8	92.3	135.1	125.7	134.1	112.9
Blue-winged teal	360.5	285.1	679.3	496.9	575.5	819.4	450.0	533.6	478.7	703.6
N. shoveler	141.0	135.7	202.1	99.1	172.7	147.0	93.1	146.3	76.8	106.1
N. pintail	145.5	110.0	180.5	82.5	311.3	276.2	169.0	227.8	95.6	310.5
Subtotal	1290.0	1240.6	1808.8	1389.2	2126.2	2307.4	1470.1	1847.4	1405.8	1820.5
Divers										
Redhead	175.4	106.2	113.2	72.9	85.9	101.0	82.7	75.8	76.7	91.8
Canvasback	126.7	93.3	109.4	80.2	73.8	71.2	80.2	42.8	68.4	40.7
Scaups	205.4	183.1	246.9	188.3	158.9	227.1	188.2	191.3	138.2	348.4
Ring-necked duck	31.6	35.8	53.9	97.3	35.5	53.5	72.3	47.4	29.8	54.6
Goldeneyes	16.9	7.6	19.6	9.5	17.5	23.6	39.2	16.0	15.6	34.7
Bufflehead	21.3	19.2	49.1	25.7	34.5	21.4	31.2	28.6	11.3	27.6
Ruddy Duck	76.2	102.3	82.5	131.2	58.0	69.5	59.8	34.5	49.7	62.8
Subtotal	653.4	547.5	674.6	605.1	464.2	567.4	553.5	436.4	389.7	660.6
Miscellaneous										
Oldsquaw	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Eiders	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scoters	2.2	5.7	3.0	9.1	1.3	5.3	6.1	1.7	5.6	17.4
Mergansers	15.0	22.9	7.0	12.4	15.0	11.2	7.4	16.6	13.0	27.3
Subtotal	17.2	28.7	10.0	21.7	16.4	16.5	13.5	18.3	18.5	44.7
Total Ducks	1960.6	1816.7	2493.4	2016.0	2606.7	2891.4	2037.1	2302.0	1814.1	2525.7
Canada Goose	8.1	9.7	4.4	21.0	17.1	21.0	25.1	22.2	30.4	22.3
Am. coot	121.0	62.5	150.3	433.8	139.3	184.2	148.0	172.8	127.3	242.4
Ponds	1122.6	1066.3	1120.0	335.3	463.1	1035.2	754.6	1013.7	433.9	1449.1

Appendix 1 (continued). Long-term trend in adjusted waterfowl breeding population estimates (thousands).

Species/Ponds	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Ducks										
Dabblers										
Mallard	476.5	679.8	482.8	429.9	417.1	596.2	467.5	521.2	427.7	233.4
Am. black duck	0.5	0.5	0.9	0.4	0.6	1.2	0.0	0.0	0.0	0.0
Gadwall	52.5	62.2	81.8	61.7	81.0	144.5	70.7	58.3	52.6	17.3
Am. wigeon	77.6	78.6	41.7	73.2	82.4	121.1	103.9	67.0	48.4	38.5
Am. green-winged teal	66.0	122.5	70.3	141.2	40.1	35.9	40.7	36.2	52.9	43.2
Blue-winged teal	410.2	722.5	435.8	383.6	536.8	528.0	386.0	496.2	314.3	201.6
N. shoveler	69.3	166.3	62.1	89.6	95.2	75.8	116.1	157.8	135.5	65.3
N. pintail	225.9	263.5	43.1	107.1	201.2	73.6	71.6	110.5	106.2	31.8
Subtotal	1378.5	2095.9	1218.6	1286.6	1454.5	1576.2	1256.6	1447.1	1137.7	631.1
Divers										
Redhead	82.7	86.2	108.8	80.6	76.5	65.4	150.9	94.8	60.5	20.1
Canvasback	90.9	127.4	74.3	57.7	60.9	75.9	101.1	65.5	48.0	56.2
Scaups	312.0	267.9	164.6	307.2	149.8	222.0	249.1	169.3	243.5	120.2
Ring-necked duck	59.7	21.8	14.6	35.8	44.6	88.3	87.8	47.6	50.0	17.5
Goldeneyes	43.7	42.5	14.4	78.2	39.9	33.2	85.9	41.9	42.8	7.4
Bufflehead	29.6	42.8	32.5	45.9	20.3	33.0	35.6	30.3	32.8	26.5
Ruddy Duck	52.6	45.7	40.2	56.3	23.3	104.7	117.0	161.8	60.6	38.9
Subtotal	671.2	634.3	449.4	661.6	415.4	622.6	827.3	611.0	538.2	286.8
Miscellaneous										
Oldsquaw	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eiders	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scoters	12.1	6.1	4.2	4.1	9.0	0.8	1.0	1.5	6.0	1.5
Mergansers	36.8	12.5	15.0	25.7	43.0	54.9	51.9	15.9	70.6	24.9
Subtotal	49.0	18.6	19.1	29.8	52.0	55.8	52.9	17.5	76.6	26.4
Total Ducks	2098.7	2748.8	1687.1	1978.1	1921.8	2254.5	2136.8	2075.7	1752.4	944.3
Canada Goose	20.9	9.3	24.3	27.5	25.7	39.5	35.8	31.9	47.1	40.2
Am. coot	312.5	485.5	267.4	128.0	196.3	499.7	404.2	197.7	135.2	55.6
Ponds	937.6	1188.7	439.9	780.3	792.4	286.7	262.8	359.0	712.4	409.4

Species/Ponds	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Ducks										
Dabblers										
Mallard	329.2	431.8	332.0	340.4	315.3	363.1	340.6	389.4	354.7	436.5
Am. black duck	0.6	0.8	0.7	0.2	0.2	0.2	0.4	1.1	0.0	0.3
Gadwall	64.3	105.7	71.2	70.3	69.6	120.1	79.7	111.9	94.4	57.6
Am. wigeon	53.5	63.4	39.5	43.6	56.1	58.1	55.0	52.5	31.9	47.3
Am. green-winged teal	24.2	55.4	46.2	38.3	40.4	41.2	39.3	138.5	24.5	32.1
Blue-winged teal	225.2	386.0	291.5	369.0	314.5	343.1	272.2	430.4	355.6	172.2
N. shoveler	99.9	165.5	115.6	122.8	79.2	95.2	88.9	151.3	79.5	64.8
N. pintail	45.8	124.0	77.9	36.4	19.6	57.4	26.6	100.2	40.5	52.5
Subtotal	842.6	1332.5	974.5	1021.0	894.9	1078.4	902.6	1375.3	981.1	863.3
Divers										
Redhead	51.3	38.3	52.2	53.6	33.5	85.0	99.9	116.3	44.2	51.2
Canvasback	60.4	57.1	42.5	56.0	53.4	68.5	65.3	80.0	69.5	100.2
Scaups	155.6	309.1	169.5	151.1	101.9	152.9	101.4	221.2	123.0	154.7
Ring-necked duck	42.7	34.5	55.5	57.2	33.8	49.3	47.4	113.8	52.6	42.2
Goldeneyes	66.7	22.8	33.8	34.5	21.1	40.6	15.0	36.1	24.8	6.5
Bufflehead	41.7	31.9	40.3	33.1	33.8	35.6	48.2	67.2	28.0	49.1
Ruddy Duck	44.5	69.9	81.0	68.1	57.9	72.7	80.5	60.8	74.6	15.1
Subtotal	462.8	563.7	474.8	453.7	335.4	504.6	457.6	695.5	416.5	419.0
Miscellaneous										
Oldsquaw	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	1.3
Eiders	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scoters	3.6	0.3	1.6	3.4	0.2	0.3	1.8	4.8	3.0	1.5
Mergansers	35.6	28.0	23.6	28.3	25.1	47.8	23.6	27.2	24.8	26.1
Subtotal	39.2	28.3	25.2	31.6	25.3	48.1	25.3	32.0	28.3	28.8
Total Ducks	1344.7	1924.5	1474.5	1506.3	1255.6	1631.2	1385.6	2102.8	1426.0	1311.1
Canada Goose	43.2	45.2	38.5	74.6	97.0	52.9	61.1	67.2	74.4	52.6
Am. coot	78.7	217.9	163.2	773.9	129.8	180.3	129.1	266.0	173.5	44.6
Ponds	496.3	947.5	498.1	632.5	284.2	662.4	393.1	664.8	483.4	395.7

Appendix 1 (continued). Long-term trend in adjusted waterfowl breeding population estimates (thousands).

Species/Ponds	1995	1996	1997	1998	1999	2000	2001	2002
Ducks								
Dabblers								
Mallard	514.8	439.6	502.2	507.2	585.6	455.7	476.0	499.2
Am. black duck	0.6	0.0	0.0	0.7	0.0	3.0	0.0	0.3
Gadwall	94.4	106.1	97.7	106.1	118.1	90.9	114.1	144.9
Am. wigeon	50.4	50.9	41.8	34.0	42.8	42.0	22.2	43.7
Am. green-winged teal	55.6	132.0	75.5	48.7	48.9	63.5	33.7	43.6
Blue-winged teal	328.9	340.4	326.0	303.9	497.6	401.0	520.6	335.7
N. shoveler	172.8	187.4	166.5	115.4	169.5	194.0	215.2	119.5
N. pintail	123.8	85.4	65.0	64.9	62.8	45.7	100.7	34.0
Subtotal	1341.2	1341.7	1274.7	1180.8	1525.3	1295.9	1482.5	1220.9
Divers								
Redhead	133.5	89.7	79.4	170.7	87.4	125.6	124.5	79.5
Canvasback	111.3	115.6	90.7	88.9	98.1	94.8	74.4	86.4
Scaups	183.9	215.0	116.4	77.2	120.6	83.4	88.3	68.6
Ring-necked duck	46.2	45.4	49.5	41.1	37.1	70.7	66.5	93.3
Goldeneyes	41.3	64.6	40.0	51.9	44.0	50.7	52.5	37.6
Bufflehead	50.7	36.5	63.0	47.7	62.2	46.0	46.5	40.0
Ruddy Duck	47.5	40.7	39.1	15.7	56.0	48.8	66.2	121.3
Subtotal	614.4	607.6	478.2	493.1	505.5	519.9	519.0	526.8
Miscellaneous								
Oldsquaw	0.5	0.0	0.0	0.9	0.0	0.0	0.0	0.0
Eiders	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scoters	0.7	1.4	3.4	3.0	0.8	0.7	0.0	1.3
Mergansers	14.1	32.2	67.4	18.5	50.7	31.8	38.7	16.0
Subtotal	15.2	33.6	70.8	22.4	51.5	32.5	38.7	17.2
Total Ducks	1970.9	1982.9	1823.6	1696.3	2082.3	1848.3	2040.2	1764.9
Canada Goose	62.1	66.9	79.2	60.3	50.9	57.3	53.9	92.9
Am. coot	199.7	284.9	288.5	537.4	182.4	410.2	346.1	439.8
Ponds	889.4	829.8	968.5	492.1	610.7	465.7	785.8	327.2

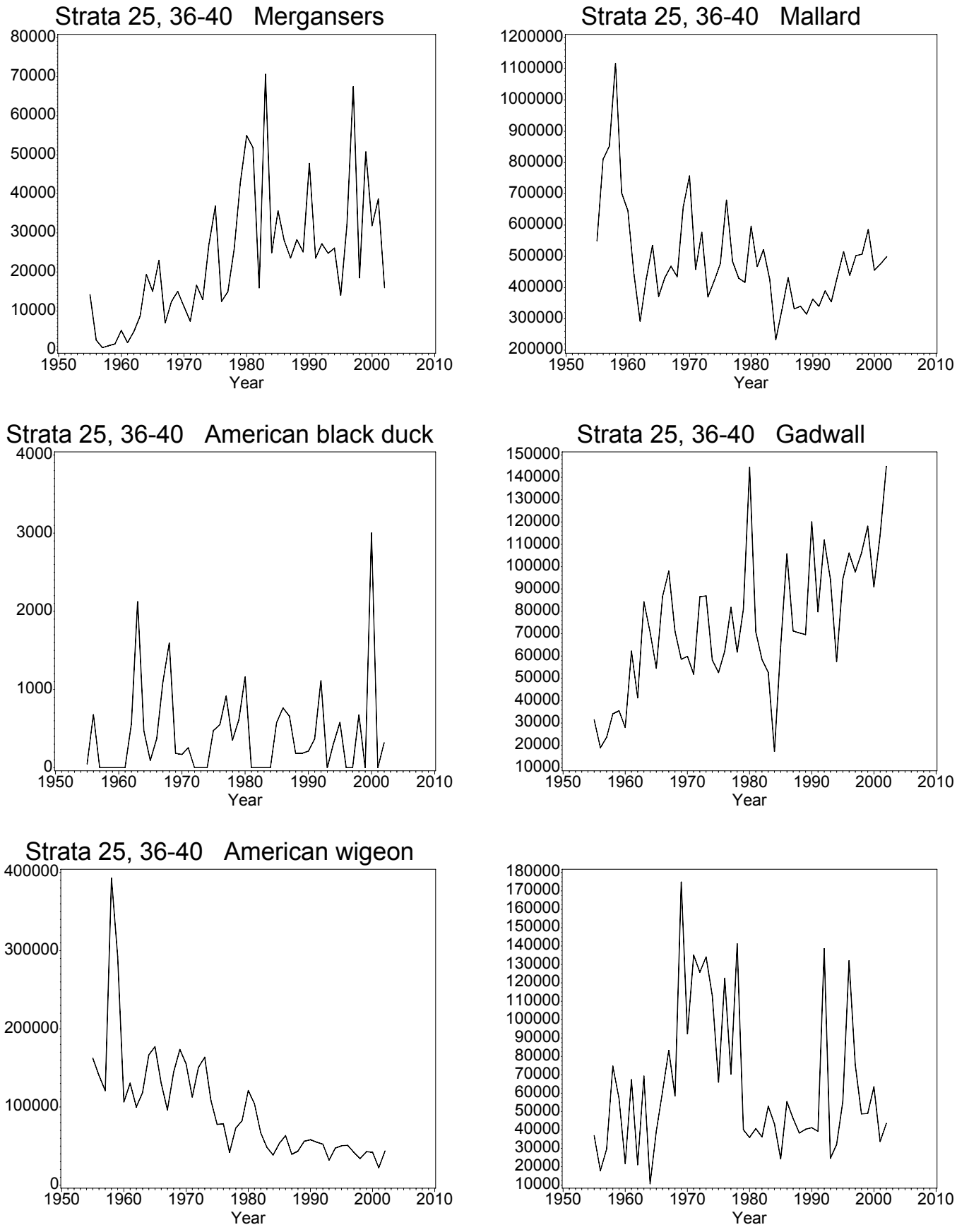
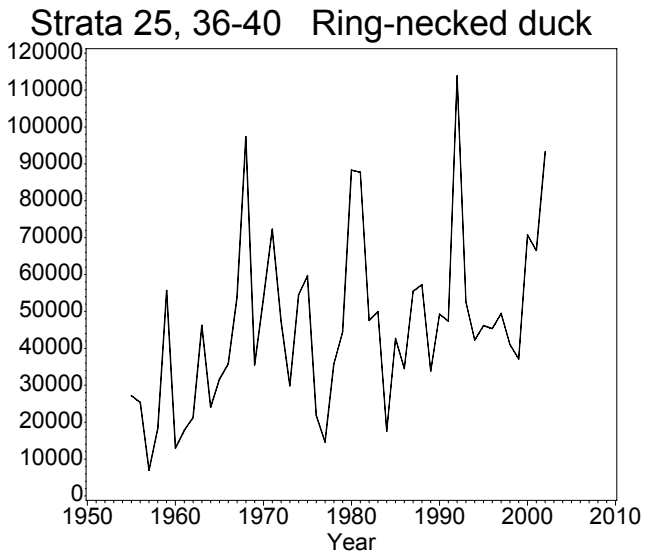
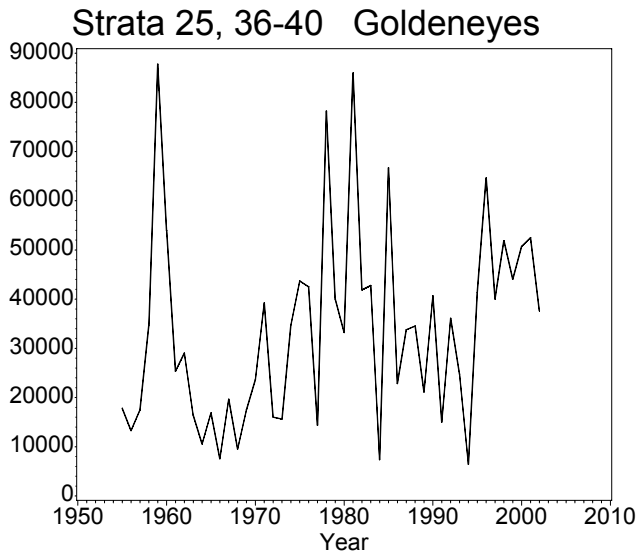
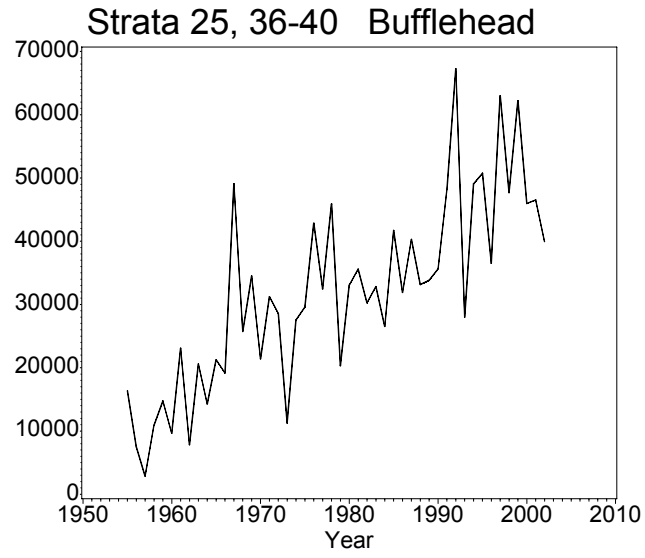
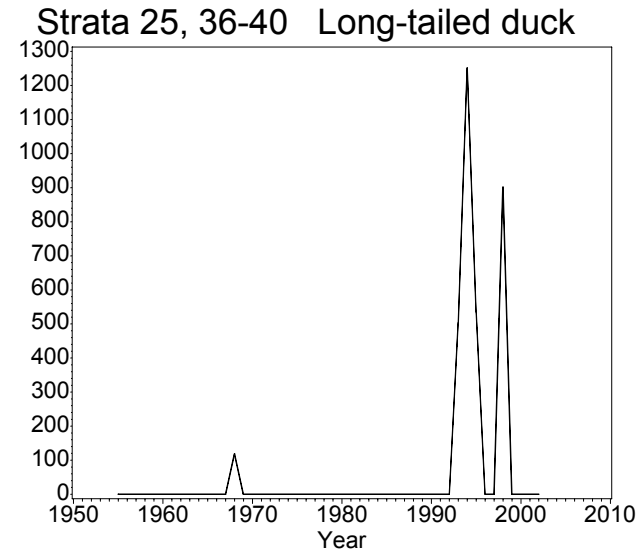


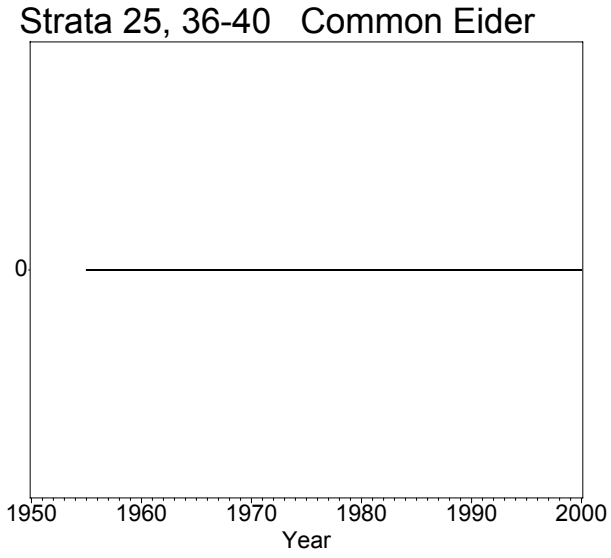
Figure 1. Population estimates for the individual waterfowl species and ponds on an annual basis.











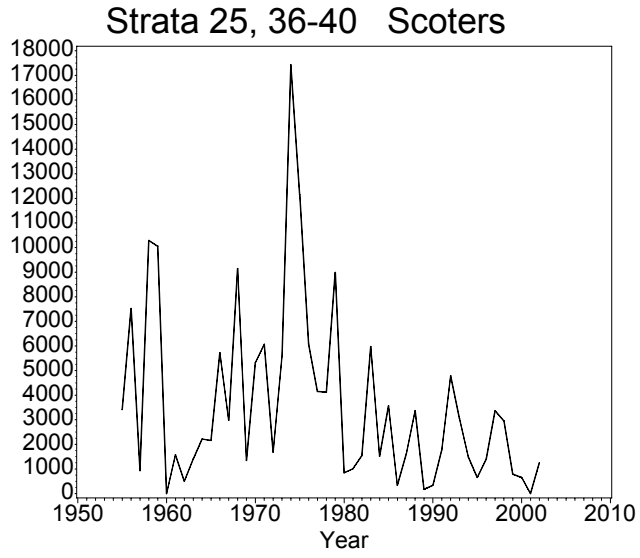
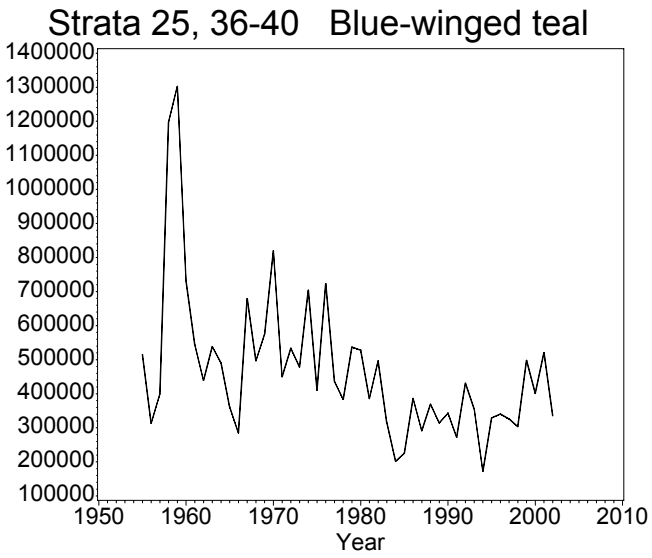
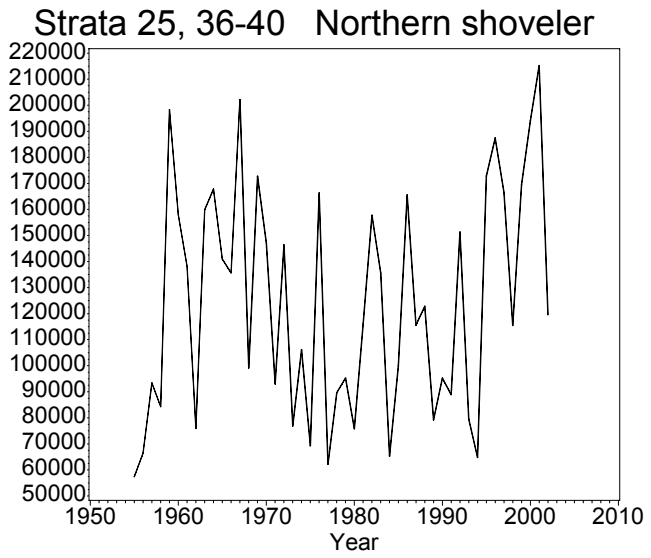
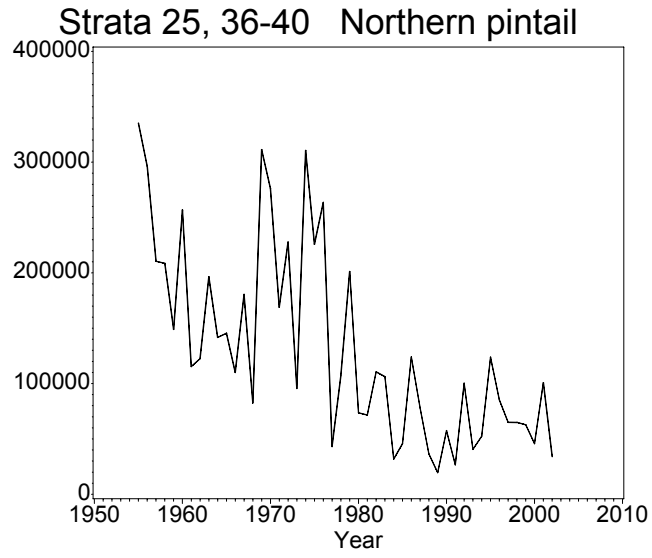
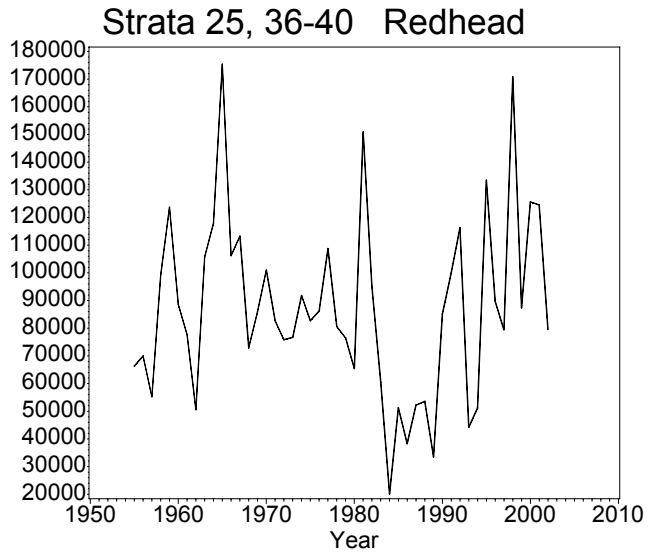


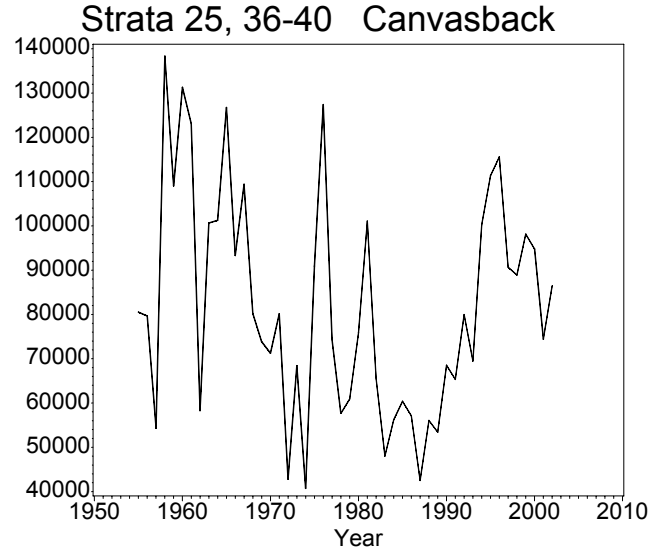
Figure 1 continued.

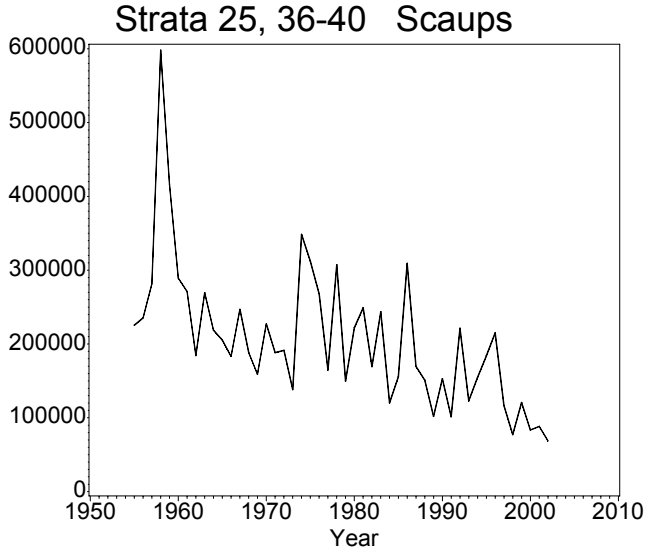












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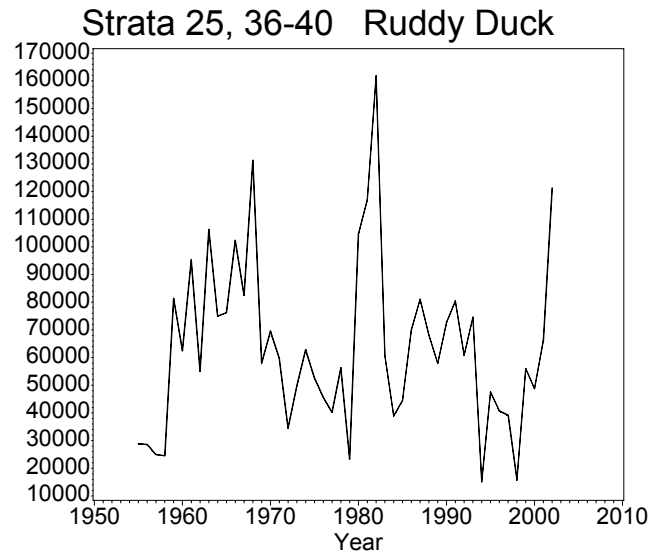

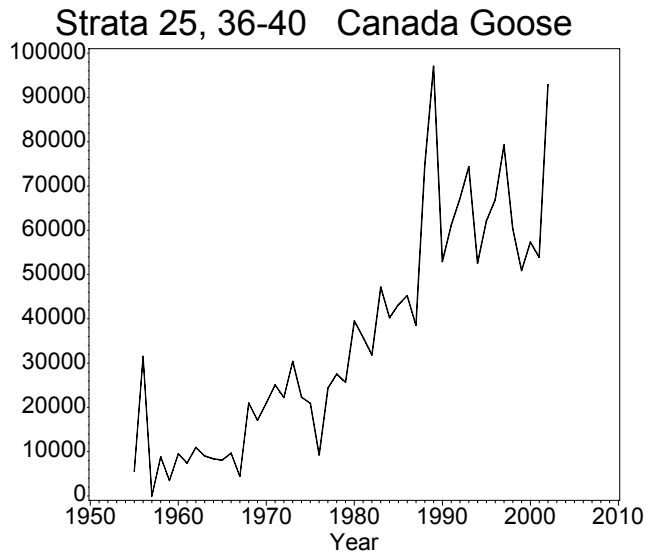

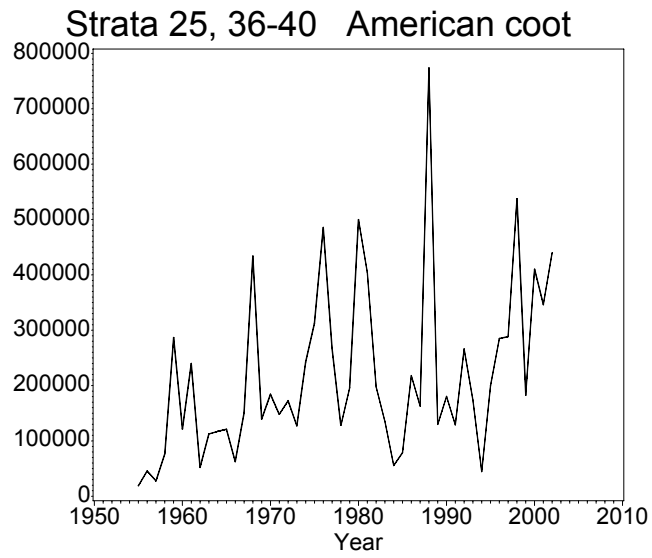

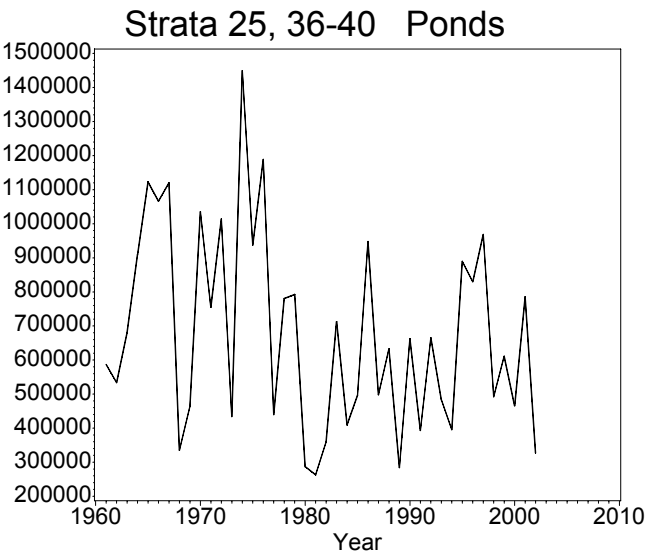

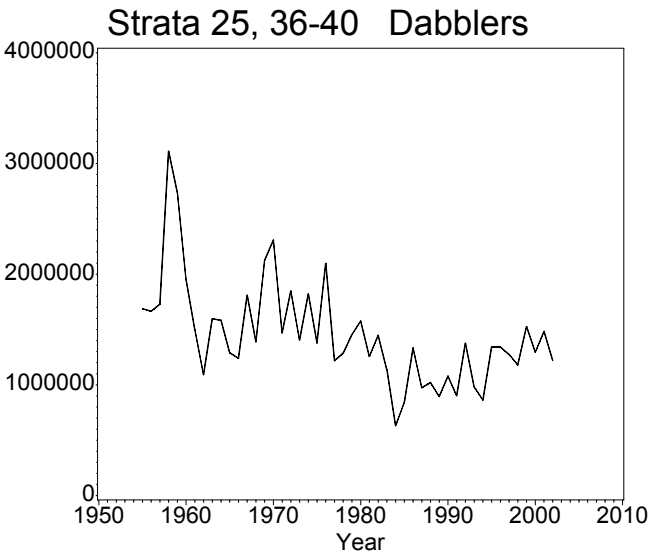

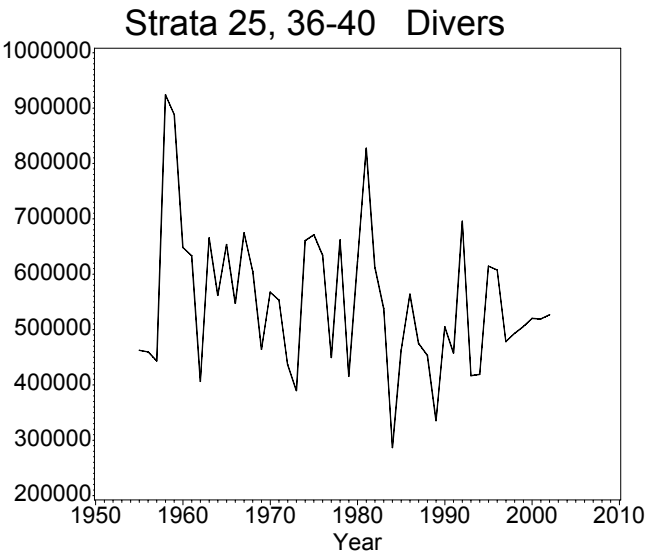

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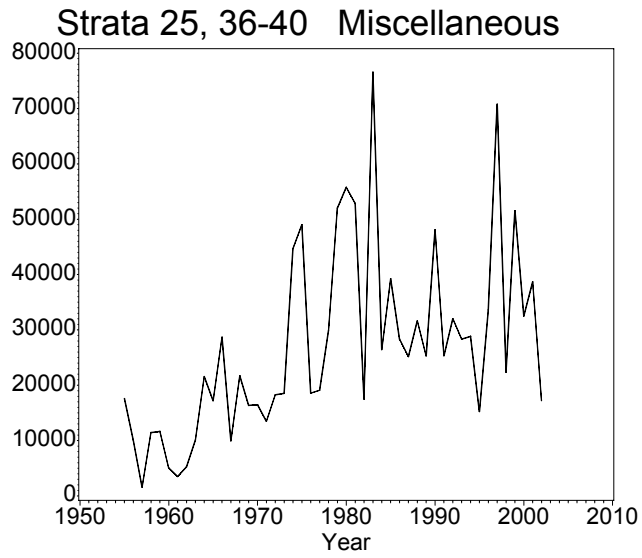

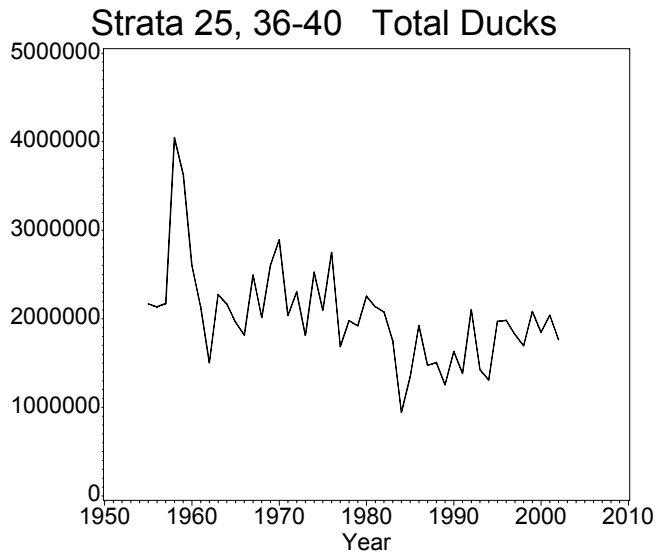

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